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TRAINING PRESCHOOL CHILDREN TO RECRUIT NATURAL COMMUNITIES OF REINFORCEMENT[1]

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Four normal and four deviant children aged four-to-six years were taught to judge the quality of their academic work in a preschool classroom, and to prompt or cue their teachers to comment about the quality of that work. When these skills did not generalize spontaneously to other teachers in concurrent natural situations, generalized responding was taught by the experimenter, in multiple-baseline design across subjects. This generalization programming enabled the children to contact a sometimes dormant, but readily available natural community of teacher praise and reinforcement, *i.e.*, to recruit an increase in cued praise and schedules of praise for their good work. These behaviors may be important to young children who find themselves bereft of attention in classrooms.

DESCRIPTORS: cueing praise, prompts, generalization programming, change agents, teacher behavior, student behavior, preschoolers

The generalization of specifically taught behavior changes has become an issue of increasing emphasis in recent years. Reviews of generalization research (Marholin, Siegel, and Phillips, 1976; Stokes and Baer, 1977; Wildman and Wildman, 1975) have documented frequent close discrimination of the effects of behavioral intervention programs, as well as the need for a systematic analysis of generalization as a process. These reviews also have served to highlight a burgeoning technology of generalization-programming procedures, which might complement the relatively thorough technology of behavior-changing procedures.

One of the programming categories discussed by Stokes and Baer (1977) concerned the introduction of subjects to natural maintaining communities of reinforcement. In this technique, subjects are exposed to natural environments that are strategic, in that they already function to maintain behaviors similar to the experimentally modified behavior. These environments can then be trusted to operate on the subject for similar benefit in the absence of experimental intervention. Thus, a child who lives with peers who themselves possess adequate social skills may be taught social skills in the reasonable expectation that when those skills are practised in the presence of the peers, they will be reinforced in various ways. The reinforcement initially required for the first teaching of these skills then will become irrelevant; the natural community of reinforcement contingencies not only should maintain the child's new skills, but indeed may be expected to sharpen and refine them, and add entirely new ones as well. For example,

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Baer and Wolf (1970) reported a study by Ingram in which a young child's interaction with his preschool peers was modified initially by contingent teacher attention. However, eventually the teachers no longer were able to control the interactions by their own social consequences; apparently the natural consequences from peers had assumed functional control of the interaction behavior.

One problem with these techniques is that natural communities of reinforcement need to be functioning and identified as such before they can be used advantageously. Furthermore, the existence of such environments might not be extensive; at least, they are not well researched and noteworthy at present. In some instances, there may not even be any such communities to be tapped for the development and maintenance of skills. Thus, the use of natural reinforcement communities might seem to be a powerful programming tactic only when those communities are found already in operation.

However, an active approach to natural communities is possible, as exemplified in a study by Seymour and Stokes (1976). They taught delinquent girls to work better in the vocational training areas of their residential institution. However, the staff of the institution did not thereupon change their rate of positive interaction regarding the girls' improved work—the presumed natural community of reinforcement (surprisingly) did not exist. The experimenters then taught the girls to prompt or cue the staff for evaluations of their work, when it was of high quality. Under these conditions, staff praise for good work increased. The present study took a similar active approach, in that preschool children were taught to recruit praise for their good work from their teachers. Furthermore, the present study reliably examined cueing as the major dependent variable, rather than as an adjunct to other experimental procedures, as occurred in the Seymour and Stokes (1976) study.

The control of adult behavior by children's behavior has been discussed by Graubard, Rosenberg, and Miller (1971), Cantor and Gelfand (1977), and Sherman and Cormier (1974). These studies emphasize the important function of child behavior in adult-child interactions, and also depict some of the many types of behaviors that might be used by children in their active trapping of natural reinforcement communities. Sherman and Cormier (1974) studied a fifth-grade teacher's reactions to two disruptive children in her classroom. Experimenter (not teacher) feedback and reward were used to modify the children's behavior so that they displayed appropriate classroom behaviors (following instructions, paying attention, raising hand, *etc.*). During those periods of improved child behavior, teacher attention to appropriate behavior increased. Concurrent changes were noted in the rate of praise by the teacher and in the teacher's ratings of the children's appropriate classroom behavior.

The effects of the responsiveness of 7- to 10-yr-old children on adults' behavior was studied by Cantor and Gelfand (1977). The children were trained through instructions, modelling, role-playing, and monetary reward to look at and smile at adults, to talk politely and enthusiastically with adults, and to ask for feedback after completion of building and drawing tasks (*e.g.*, "How's this look?"). The authors found that responsive children received more attention and assistance from the adults than did unresponsive children. However, there was no significant difference in the rate of praise given to the children in each condition. In addition, the adults rated the responsive children more positively on personality characteristics such as likeability, adeptness at task, naturalness of behavior, and intelligence.

Graubard *et al.* (1971) taught seven children from special education classes to modify the frequency of positive and negative contacts with teachers in regular classes. The children were taught to make eye contact with teachers, ask for help, sit up straight, and make positive comments to teachers (*e.g.*, "I like the way you teach that lesson."). They were also taught to ignore

teacher provocation. Positive teacher-child interactions increased and negative contacts decreased during the intervention period.

In the present study, reinforcement techniques were employed to teach preschoolers how to increase positive teacher-child interaction regarding their academic work quality. After a period of training in one setting, the children were rewarded for displaying improved independent work skills in a generalization setting with other teachers. The children were also taught to prompt or cue positive teacher comments regarding their work quality and output. These skills may be especially important to young children who find themselves bereft of attention in classrooms, perhaps because they are labelled deviant, or perhaps because they do not represent a problem to their teachers. Deviant children might benefit particularly from these special procedures because their "deviant" label often follows them through their schooldays and so it might be advantageous for these children to have skills in their repertoires that could be used, if required, to modify interaction with their teachers in a positive way.

EXPERIMENT 1

Subjects and Setting

The children involved in this experiment were normal preschoolers attending morning classes at an experimental preschool at the University of Kansas. Paul, Betty, and Steve were 5 yr old; Greg was 4 yr old. The parents gave permission to involve the children in this study.

Two teachers were involved in this study as probers for generalization of skills taught by the trainer-experimenter. The teacher-probers were paid for their participation. Mary (27 yr old) was a trained teacher with 5 yr experience in preschool and grade schools. Jane (21 yr old) was a senior with 2 yr experience in preschool teaching. Neither had been trained in behavior-modification procedures. In general, the probers understood that the aim of the experiment was to assess the children's generalization of work skills in the presence of teachers like themselves. However, by mutual agreement, the probers remained naive concerning specific experimental procedures until the experiment was completed.

The experimental setting was a small 2.1-m by 1.5-m tutoring room adjacent to the children's regular classrooms. The room contained a small table and two chairs. Experimental sessions with the trainer-experimenter were conducted in this room. This setting also served as the generalization setting on different days with the teacher-probers.

Behaviors

Social interaction. Observers scored student-teacher/prober interactions from behind a one-way mirror. *Cues* and *praise* were scored according to a 10-sec interval recording procedure. Cues were defined as statements by the child to the trainer or prober inviting favorable comments or positive evaluations of the child's work or general behavior, *e.g.,* "Look how much I've done" and "Is this right?" Trainer or prober praise was defined as verbal praise, encouragement, positive evaluative comments, and statements of approval of the child's general behavior or work, *e.g.,* "That's very good" and "You're working well".

Assessment of the reliability of recording each child's behavior was conducted during each experimental condition. Reliability of recording was checked on five days in Paul's case, eight days in Greg's case, 14 days in Betty's, and 12 days in Steve's. During reliability checks, two independent observers simultaneously scored the experimental sessions. Later comparison of agreements and disagreements about the occurrence of cues and praise showed 89% (24/27) observer agreement about cues, and 94% (47/50) about praise. Occurrence reliability was computed by dividing the number of agreements about occurrences by the number of agreements plus disagreements about occurrences, and multiplying by 100. Occurrence reliability was computed because cues and praise were recorded in fewer than 20% of the observation intervals.

Academic production. During experimental sessions, each child worked on paper-and-pencil writing tasks that involved practice in tracing straight and curved lines and letters. These materials were taken from the pretest of the Behavior Analysis Handwriting Primer (Stonger, Weis, Brigham, Breunig, and Krompotich, 1974). Each day, six pages were available for completion; each page consisted of four different items each repeated five times. The same six pages (which differed from one another) were presented in random order each day. Items were scored as correct if the lines had been traced completely and with deviations not greater than 1.6 mm from a perfect line. Both the number of items attempted and the number correct were counted.

For each child during each experimental condition, a comparison was made of the total items scored as attempted and correct by independent observers. Reliability was assessed on three days in Paul's case, two days in Greg's case, four days in Betty's, and four days in Steve's. Percentages of interobserver agreement were 100% (1095/1095) for items attempted and 92% (720/784) for items correct.

General Procedure and Design

One adult and one child were present during each experimental session. Each child was brought from the classroom to the tutoring room by the trainer or by one of the probers. The child was then asked to go over the lines on each page and go on to the next page after completing any page. This work continued for 9 min. Interaction was scored for 10 min, the additional minute being recorded because positive interchanges were likely after work had been completed. The interaction data presented later represent 10-min sessions. After the work time had elapsed, the child chose a small toy "for coming today"; this toy was given uncorrelated with rate or quality of work behavior. Following the experimental session, the child went back to the classroom with the trainer or prober.

All experimental sessions preceding training were with the trainer. After training had begun, experimental sessions conducted by the trainer were interspersed unsystematically among generalization sessions conducted by the two probers. These generalization sessions allowed an assessment of spontaneous generalization of the work and cueing skills taught by the trainer. Training sessions ceased within three days after generalization programming procedures were instituted. Later in the experiment, only the probers alternated in conducting experimental sessions.

Experimental control of both the training and the generalization-programming procedures was demonstrated in multiple-baseline designs. That is, training was introduced with each subject at different times and after different numbers of baseline sessions with the trainer. Similarly, the generalization programming procedures were introduced with each subject after different numbers of baseline sessions with the probers.

Training

During training, each child was taught the dimensions of good work. The trainer asked each child to practise good lines by staying close to the dashed lines on the writing pages, to erase and correct errors, and to work consistently and quietly. The trainer offered feedback and praise concerning the child's performance. In addition to this training, each child was taught, through instructions, role-playing, feedback, and praise, to prompt or cue the trainer for positive evaluations when their work had been of a high quality. That is, they were taught a number of different cues such as "Have I worked well?" "Have I been working carefully?" "How is this work?" "Look how careful I've been," and "How is this?" In this way, a chain of responding was taught: do good work, then evaluate the quality of that work, and, when the quality was good, cue the trainer to evaluate that work. For example, the children were taught that good work often meant finishing a page without many mistakes, *i.e.,* working carefully for a period of time.

Generalization

Generalization sessions were conducted in the same tutoring room as the training, but on other days and with the teacher-probers (Mary and Jane). The 10-min generalization sessions with these two probers were not as structured as the training sessions. The probers were asked by the trainer to instruct the children to work at their work sheets, but the probers were not told how to conduct the session. Because they were experienced teachers, it was assumed that they already had a certain teaching style, and the experimenter did not intervene or give feedback to the probers about their performance.

The intervention in the generalization sessions consisted of the trainer instructing each child to do the same with probers as they had been doing with the trainer, *i.e.,* work carefully, evaluate their work quality, and ask the prober a few times about the quality of their work, but do not ask too often. Initially, these instructions were given during training sessions. After training ceased, the instructions were given at the end of the preschool day when the trainer saw the children in their classroom. Some time after the generalization session had been completed, the children were contacted in their regular preschool classrooms by the trainer. They were asked if they had done careful work, and if they had asked the prober about that work. If in fact they had followed the trainer's instructions, and also reported that they had done so, they earned a small toy.

Results and Discussion

Figure 1 shows the number of cues made to the trainer by each child during training sessions (not the generalization sessions). According to the multiple-baseline design, each subject showed an increase in the number of cues from a zero baseline to posttraining means of 6.1 cues by Steve, 8.9 cues by Betty, 6.7 cues by Paul, and 6.5 cues by Greg.

Figure 2 shows each child's cues to probers during the interspersed generalization sessions. During the baseline condition, spontaneous generalization from the training sessions occurred only for Steve. After the generalization-programming intervention, however, each child increased in the number of cues presented to each prober. The number of prober cues by Paul increased from a baseline mean of 0.0 cues to a generalization-programming mean of 3.4 cues per day. Greg increased from a mean of 0.0 cues in baseline to a mean of 4.0 cues in the generalization-programming condition. Betty increased from 0.0 cues to 3.9 cues, and Steve from 1.1 cues to 2.1 cues. Thus, these children generalized their cueing to natural academic interactions with teachers. Such one-to-one interactions often occur in classrooms and so are probably ideal for cueing because the teacher is close by the child and available for individual feedback and teaching.

Even though Steve's behavior changes were the least dramatic, and probably were accounted for in large part by data projections from baseline trends (mostly a function of data from Days 12 and 14 with prober Jane), they, nevertheless, were the most impressive in their consistency and level. His rate of a few cues in 10 min was probably the most appropriate rate displayed by any child. Such a low rate may be desired in that a potential problem with teaching these skills is that a child might cue a teacher too often, thereby becoming a "pest", a counterproductive outcome. Thus, such training should establish optimal rates of cueing, *i.e.,* rates high enough to be consistently successful, but low enough so that the child will work relatively independently and therefore not be considered a nuisance. A rate of two to four cues per session was sought; this rate of cueing was chosen after consultation with a number of preschool teachers.

Anecdotally, it was observed that the children's generalization reflected the diversity of the three or four cues taught in training. However, stereotyped responding often occurred initially, and variation of cueing responses therefore was stressed by the trainer in his instructions to the

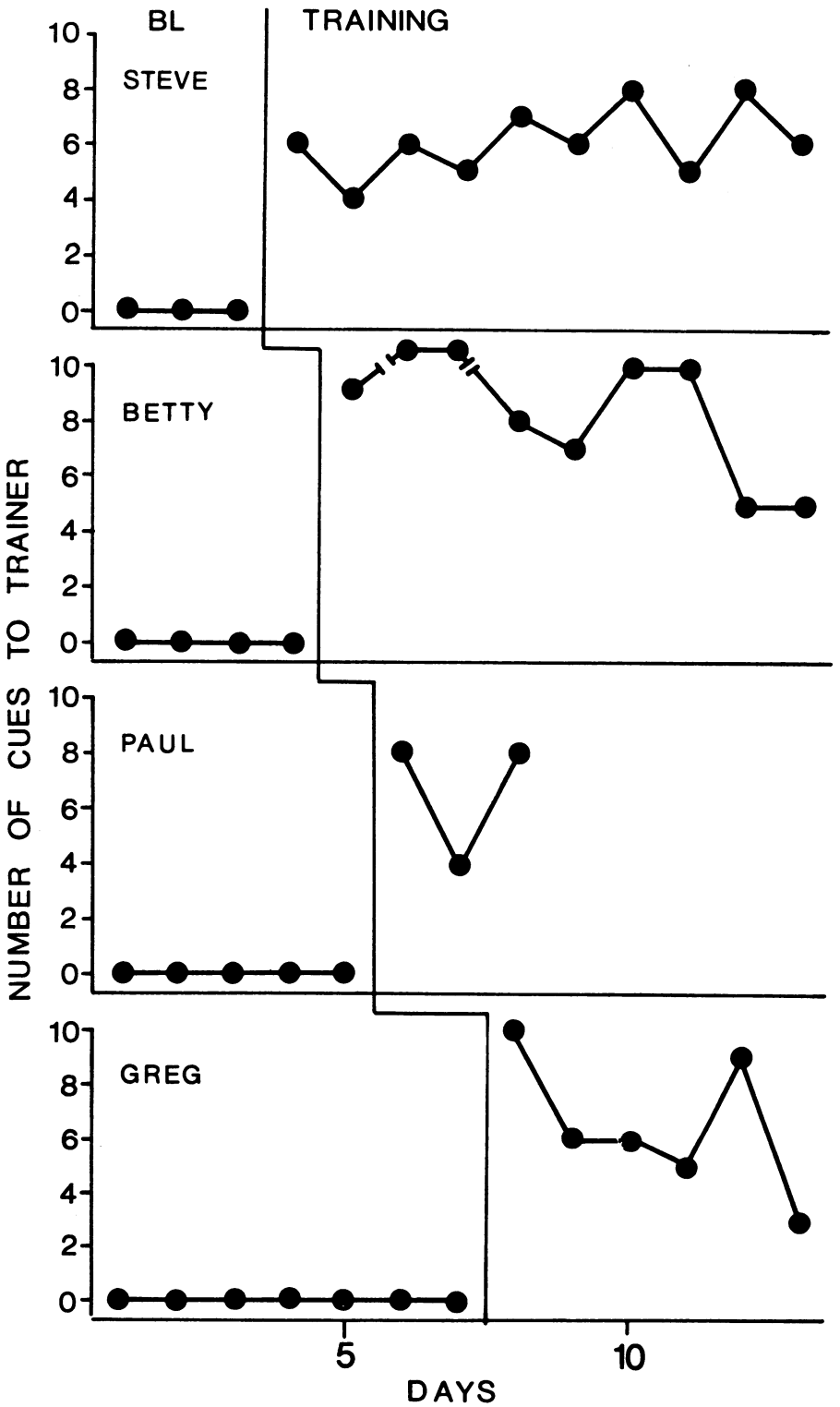

Fig. 1. Experiment I: number of cues given to the trainer during training sessions.

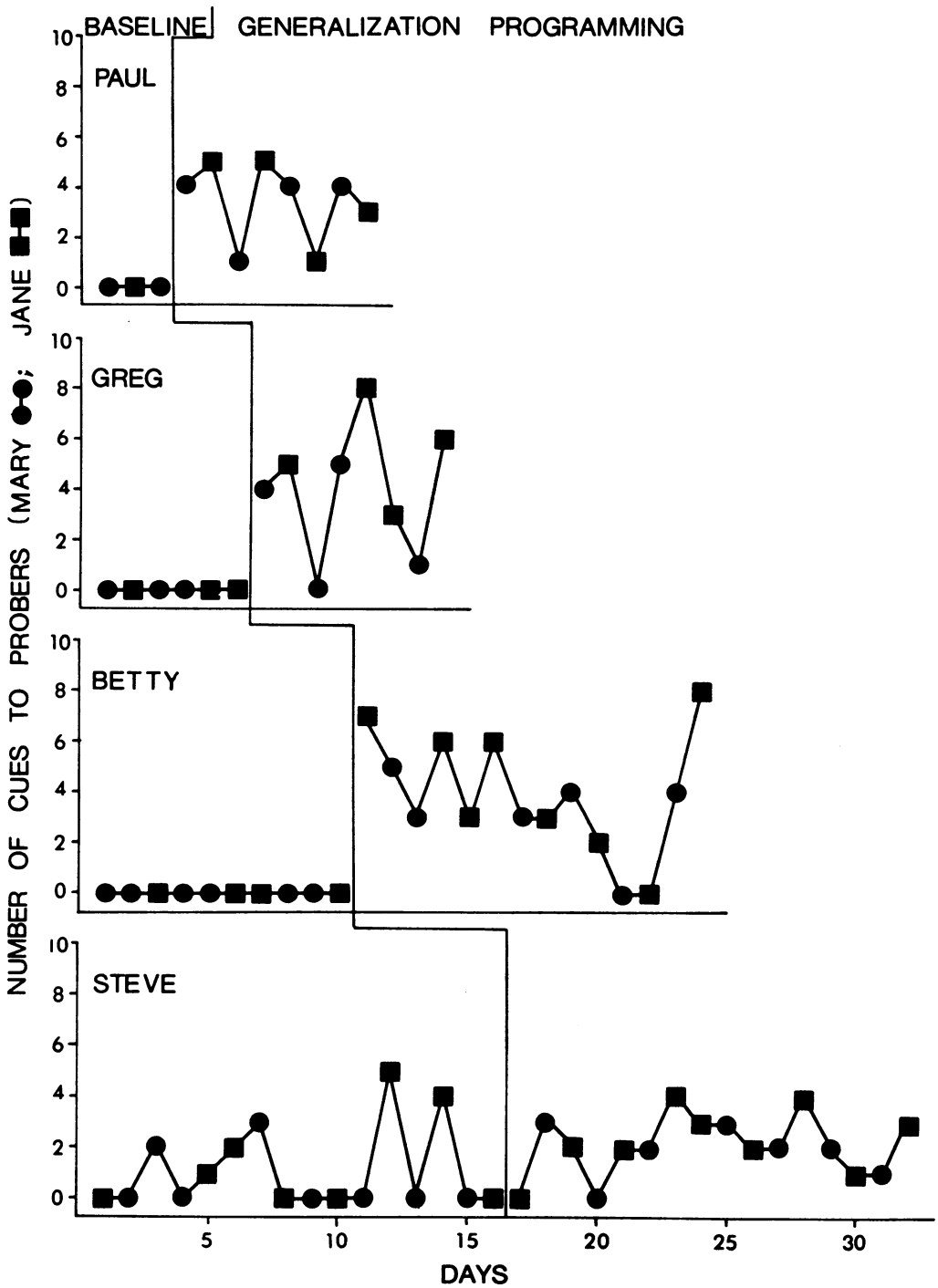

Fig. 2. Experiment I: number of cues given to probers during generalization sessions. One prober is represented by square points, the other by round points. These generalization-probe sessions began after the trainer began training sessions; thus, the baseline period in this figure is a spontaneous generalization condition, to be compared with the subsequent rate of cues given to probers during programmed generalization.

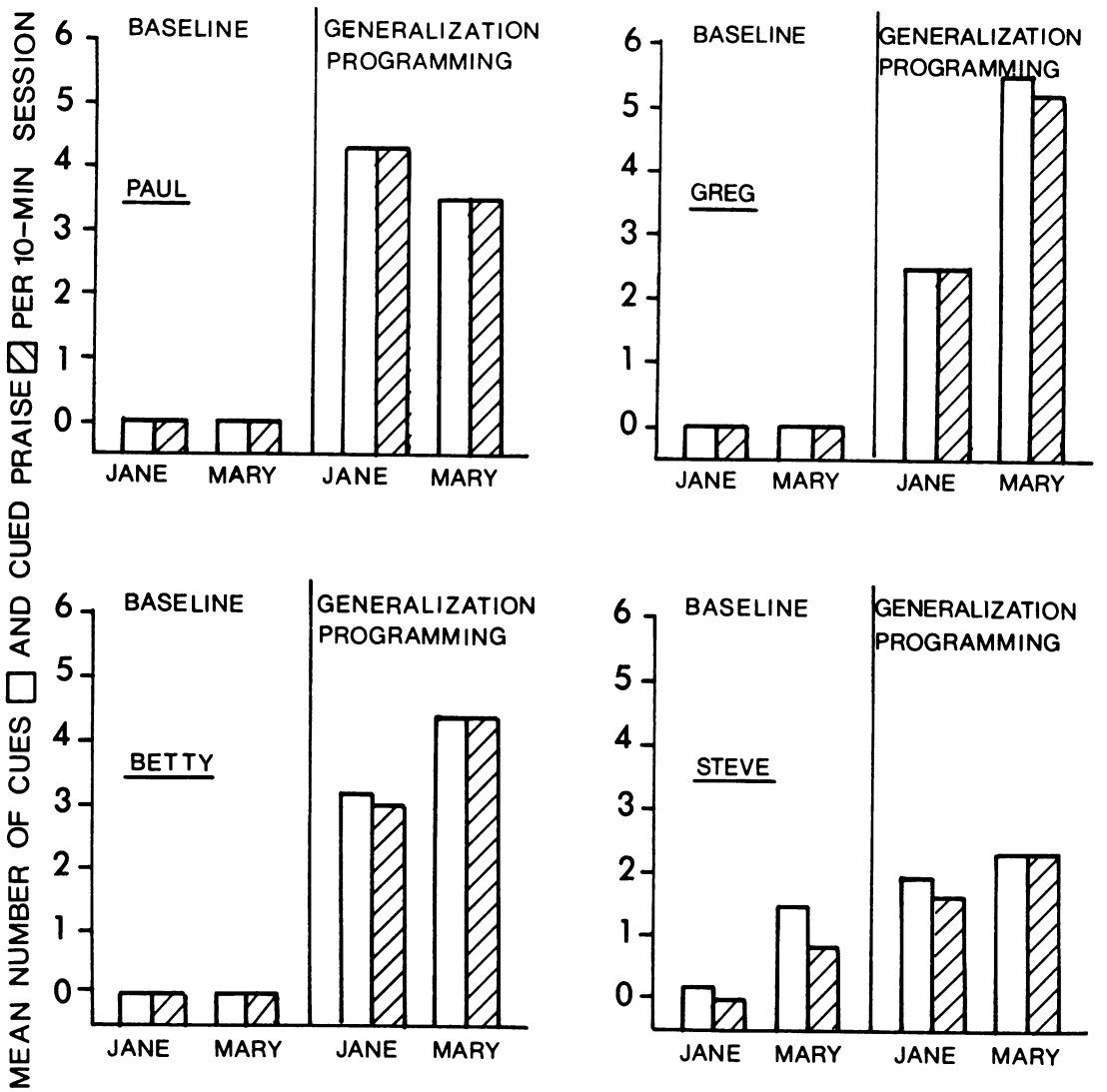

Fig. 3. Experiment I: mean number of cues given to, and cued praise received from each prober during each experimental condition. Open bars indicate the mean number of children's cues to probers; shaded bars show the mean number of the prober's praises following cues.

children (*e.g.*, "Try to say something different each time"). Most of the time, the children later reported their generalization accurately to the trainer. Paul and Steve were always truthful, even though they missed their toy on some days because of an adverse self-report. Greg and Betty failed to report their performance accurately on a few days. Gently confronting these children (*e.g.*, "Are you sure?" or "I don't think you did") was sufficient to facilitate accurate accounts thereafter.

Figure 3 shows the mean number of cues given and cued praises received with each prober during each experimental condition. This figure shows that the children increased their cues to each prober during the generalization-programming condition. In addition, it shows that cues were very successful in evoking praise (*i.e.*, praise occurring within 20 sec of a cue). Approximately 90% of the cues were followed by praise. This outcome was considered to be most satisfactory because on some occasions children

were noted (anecdotally) to cue at inappropriate times (*e.g.,* after poor work), and on those occasions the probers usually refrained from offering praise. This showed that the probers were discriminating performance levels and acting as differential reinforcers of good work.

There was also an increase in the rate of total praise. During baseline, 1.0 praise per day was received by the children, on average. During the generalization-programming condition, a mean of 4.4 praises per day was received during generalization sessions. Significantly, 85% of this increase occurred as a function of cues, *i.e.,* 15% of the increase was uncued praise. Uncued praise increased from a mean of 0.8 praises per day during baseline to a mean of 1.3 praises per day during generalization programming.

Figure 4 shows each child's academic production during the generalization sessions. After the generalization programming procedures were instituted, the number of correct work items and the percentage of correct work items increased and stabilized at a higher level for all children. In general, the children averaged 34 items correct (47% of items attempted) during baseline and 55 items correct (72% of items attempted) during the intervention.

There was also a higher rate of teacher praise during the generalization-programming condition, but this may have been a function of the probers' recognition of increased accuracy of work output. Therefore, an analysis of schedules of praise for items correct and items attempted was made. Schedules were calculated by dividing the total number of items attempted or correct in each condition by the total number of praises in that condition. This analysis (Table 1) showed that the children had modified the probers' behavior, even after allowing for their increased work output. These data, together with the data on cued praises are most significant, for they establish that the children were able to contact, recruit, and cultivate a dormant, but readily available natural community of increased reinforcement. It could be expected, then, that the increased rate of praise evoked might maintain the children's improved performance, and the children's cueing might maintain the praise, as a function of the reciprocal interaction (*cf.* Baltes and Reese, 1977). Perhaps the trainer then could remove all experimental manipulations and the behavior changes might be maintained, a generalization across time.

EXPERIMENT II

Subjects and Setting

The second experiment was conducted to replicate the generalization conditions of the first experiment in a regular preschool classroom. In addition, this experiment was conducted with deviant children who had completed 1 yr of kindergarten, but because of comprehensive academic and behavior problems they were referred to the remedial summer class by their school psychologists. The four subjects, John, Jim, Ray, and Kevin, were 6-yr olds. Parental permission to involve these children in this study was obtained.

The two teachers involved in this experiment also were experienced preschool teachers, but

Table 1

Variable-ratio schedules of praise from probers for items attempted and items correct, for each subject, for baseline and generalization programming conditions (Experiment I)

	Attempted	*Correct*
Paul		
BL	VR 70	VR 20
GEN	VR 21	VR 14
Greg		
BL	VR 111	VR 18
GEN	VR 18	VR 6
Betty		
BL	VR 103	VR 64
GEN	VR 15	VR 16
Steve		
BL	VR 32	VR 13
GEN	VR 13	VR 12
MEAN		
BL	VR 79	VR 30
GEN	VR 17	VR 12

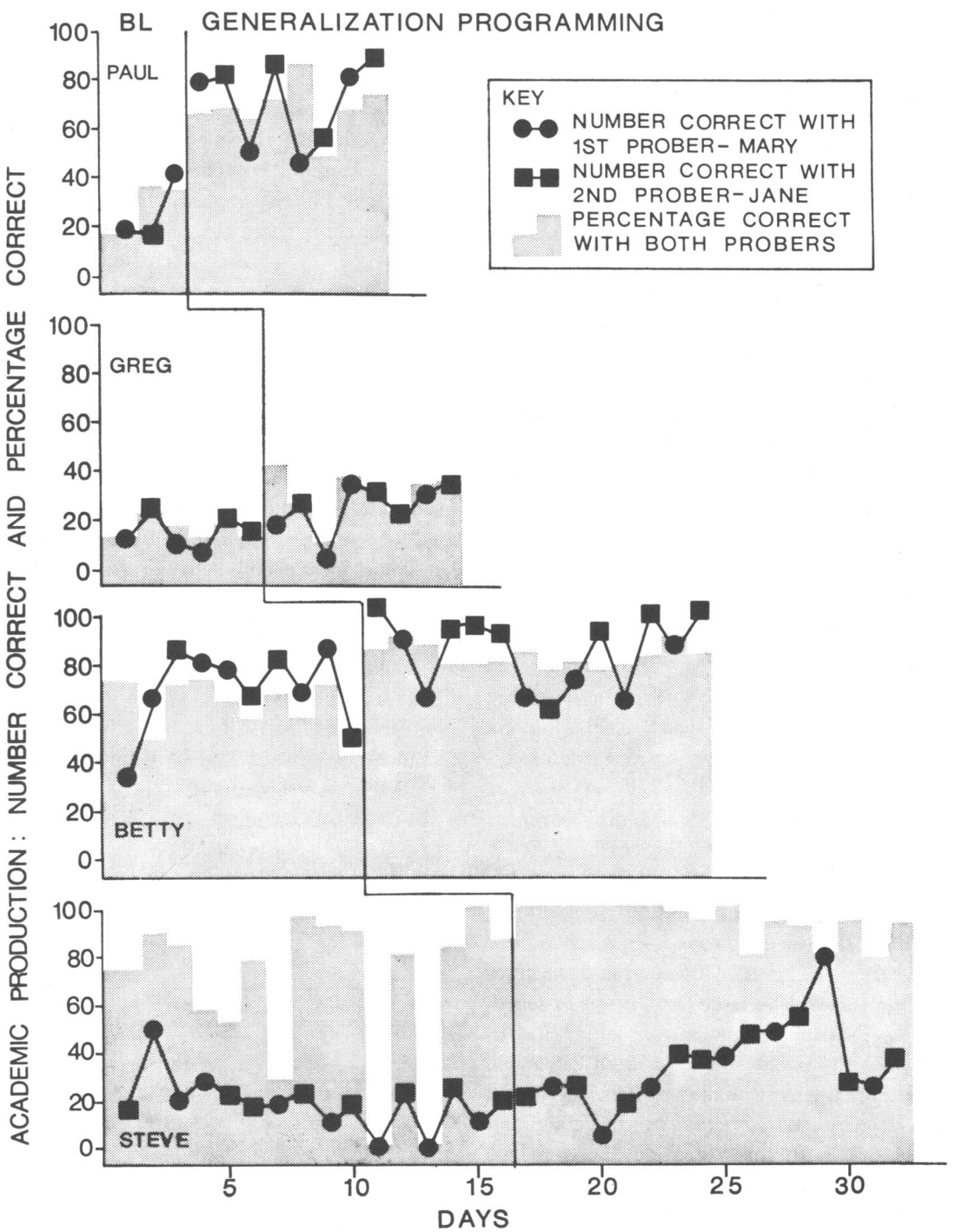

Fig. 4. Experiment I: children's academic production during generalization sessions. Bars represent the percentage of items correct of those attempted; lines superimposed on the bars represent the number of items correct.

unlike the teachers in the previous experiment, they had intensive training in behavior-modification procedures. Kerry was 30 yr old and had 2 yr of teaching experience; Ann was 24 yr old and had 1 yr of experience. These probers understood that the trainer would teach work skills and that generalization of those skills to the classroom would be examined. By mutual agreement, these teacher-probers remained naive with regard to the specific experimental procedures until after the experiment.

In this experiment, training and generalization sessions were conducted in different settings. This allowed examination of generalization across settings without the need for the experimenter to enter the generalization setting, an issue important for such natural intervention in regular classrooms. The training room was a small 2.4-m by 1.2-m experimental room down a hallway from the preschool. The academic work area of the preschool classroom, an area 4.6 m by 3.0 m, served as the generalization setting.

Behaviors

Social interaction. Interactions between the children and the probers in the generalization setting were scored by an observer sitting in the classroom work area. A 10-sec interval recording procedure was employed. Children's *cues* for positive interaction regarding work quality were defined in the same way as in Experiment I. In addition, cues were also categorized as appropriate (when the prober was within 0.6 m of the child's desk and oriented toward the child) and inappropriate (cues given at any other times). Prober *praise* was defined as in Experiment I.

Reliability of recording was assessed on eight days by having independent observers simultaneously observe and record interaction data. Later comparison of those records yielded percentages of interobserver agreements on the occurrences of cues and praise. Occurrence reliability for appropriate cues was 84% (68/81), for inappropriate cues, 83% (29/35), and for praise, 89% (402/450). If credit was given for identical scores with a discrepancy of one interval, *i.e.,* agreements scored allowing a 10-sec sliding rule, the occurrence reliability of appropriate cues was 91% (71/78), and for inappropriate cues, 91% (31/34).

General Procedure and Design

Training occurred during the classroom's first free-play period each morning. The children left the classroom in pairs at that time and went to the training room for the 5- to 10-min joint session with the trainer. The training was then repeated for the other two children. The 40-min play period was followed by two work periods of 20 min each. During the first work period, four of the eight children attending the classroom (including John and Jim) went to the work area and were seated at individual desks according to a standard arrangement. One teacher-prober would conduct this session, providing various academic tasks for the children. The other four children (including Ray and Kevin) were seated around a large table in another part of the classroom, and worked on printing skills. After the first work period, both groups and their respective teachers changed areas and academic materials. Observation of the generalization sessions began when the first subject sat at the assigned desk and started work, and was concluded 20 min later. The two subjects present in the generalization setting were observed simultaneously.

Experimental control was demonstrated in a multiple-baseline design. The generalization programming procedures were introduced after eight days with John and Jim, and after 18 days with Ray and Kevin.

Training

During training, the trainer taught work and cueing skills in a manner similar to that used in the first experiment. In addition, these children were also taught to raise their hand and wait for the trainer to approach before they cued him. This procedure was considered more

appropriate to classroom situations, rather than allowing the children to initiate interaction by calling across the room to the teacher. Thus, the children were taught that an appropriate cue could be made only when the teacher was standing close by; otherwise the cue would be regarded as inappropriately given. A wide range of academic materials was incorporated into training to reflect the broad range of math, phonics, printing, and manipulative tasks used in the classroom. Diversity of cueing was considered to be important to the success of the skill taught. Therefore, to facilitate nonstereotyped cues, a range was taught, *e.g.*, "How is this work?" "Is this right?" "Am I working carefully?" and "Look how much I've done." Daily training sessions continued throughout the experiment.

Generalization

The trainer did not structure the activities in the generalization setting during baseline or generalization programming, nor did the trainer ever enter the generalization setting. During intervention in the generalization setting, the children were instructed at the end of each training session to work and cue in the same way as they had done in the training setting. Furthermore, they were asked to cue three times, to vary those cues, and to spread the occasion of those cues across the work period. Later in the day, after the work period in the classroom, each child went individually to the training room to meet the trainer and discuss performance. The children earned small toys if they had worked well and had asked the prober about their good work, and reported that they had done so.

Results and Discussion

Figure 5 shows each child's cues to probers during generalization sessions. According to the multiple-baseline design, the children increased the number of appropriate cues (closed points) to probers after the intervention. The number of cues by John to the probers increased from a baseline mean of 1.7 cues per day to a generalization-programming mean of 3.4 cues per day. Jim increased from a mean of 0.7 cues per day to a mean of 2.7 cues. Ray increased from 1.3 to 2.4 cues, and Kevin increased from 1.7 to 3.3 cues. The downward trend in Kevin's rate of appropriate cues during the last few days of the intervention probably was a function of the trainer's instructions to modify the rate downward to three cues. Even though Ray's data might be questioned, his performance was clinically significant because he had a long history of absence of interaction and academic responses in regular and special classes before the intervention effected in this experiment. Furthermore, followup data collected by the main observer from the study, taken on a day seven months after completion of this experiment showed that Ray cued his teacher in the special classroom's academic period three times in 20 min. These data substantiated the frequent anecdotal reports.

The deviant children's generalization during the baseline-training period was not likely a function of the higher rates of praise available in the classroom. The significant difference in the training between Experiments I and II was that the deviant children were taught to raise their hands and wait for the teacher to approach before cueing the teacher. In the remedial classroom, hand-raising was also required. Therefore, the "spontaneous" generalization of cueing observed with the deviant children was probably a function of the requirement that the children perform the first part of the two-component training sequence in the classroom. That is, the hand-raise probably served as a common (mediated) stimulus that facilitated performance of cueing in that setting.

The number of inappropriate cues (open points) is also presented for the fourth child, Kevin. He was the only child with any substantial rate of inappropriate cues in either experimental condition. Kevin's data show a decrease in the number of inappropriate cues from a

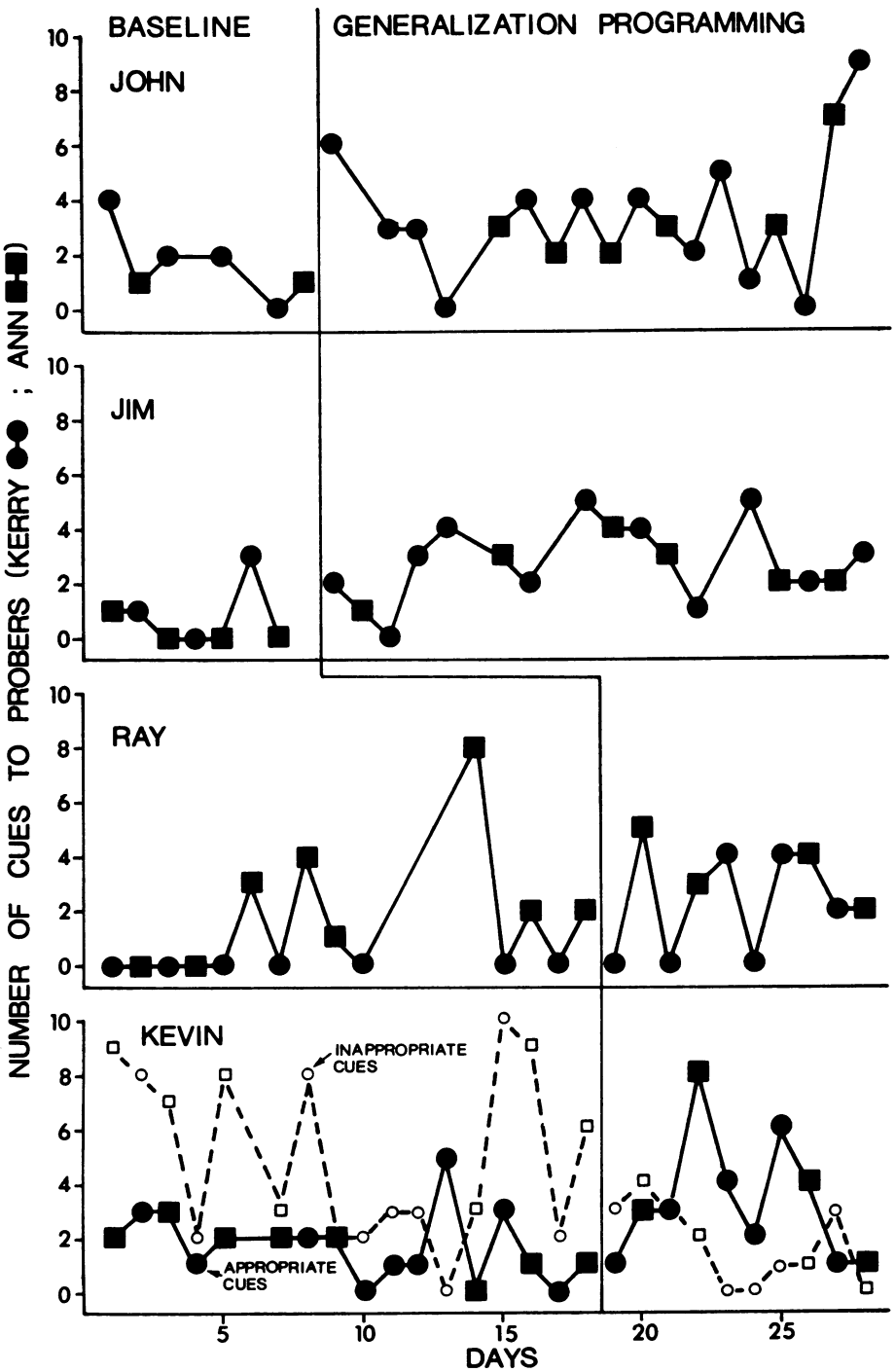

Fig. 5. Experiment II: number of cues given to probers during generalization sessions. One prober is represented by square points, the other by round points. Training occurred every day; thus, the baseline period in this figure is a spontaneous generalization condition, to be compared with the subsequent rate of cues to probers during programmed generalization. Appropriate cues are the closed points, inappropriate cues the open points.

mean of 5.1 cues per day during baseline to a mean of 1.7 cues per day during generalization programming. John's inappropriate cues decreased from a mean of 1.2 to a mean of 0.6. Jim did not change (0.1 to 0.1), nor did Ray (0.9 to 0.9). Kevin's data emphasize the importance of both rate and quality dimensions in teaching these skills to preschoolers. In his case, a high rate of cueing was already exhibited during the baseline period. However, most of those cues were inappropriate because he often called out to the prober across the classroom. During the intervention period, the overall rate of cueing was reduced, and the proportion of appropriate cues was greater and occurred at a more acceptable rate.

Another important dimension in the teaching of such cueing skills to young children is the spread of cues across the work period. Figure 6 shows the distribution of cues to probers during Experiments I and II. These data show a desirable distribution in which cues occurred throughout the work period, rather than bunching at the beginning or end of a session.

Anecdotally, it was observed that generalization reflected the types of cueing taught during training, as well as displaying cues not specifically taught. Furthermore, reliable data collected by observers from tape records show that the children displayed their cueing in another classroom setting within the preschool day, *i.e.,* data collected during the printing time (Days 24 to 27) showed that the children cued an average of three times per day (three for John, 1.5 for Jim, four for Ray, and five for Kevin). Similar cueing was reported anecdotally to occur in the children's regular classes in the public schools. Initially, the children did not report performance accurately if they had failed to follow the trainer's instructions. However, mild confrontation and questioning of false reports (*e.g.,* "Did you really?" or "I don't think you did") were sufficient to promote truthful reports.

Figure 7 shows the mean number of appropriate cues given and cued praise received, with each prober during each experimental condition. This figure shows that the children increased their appropriate cues to each prober during the intervention condition. These cues were quite successful in evoking praise from each prober. During baseline, a mean of 81% of appropriate cues was followed by praise within 20 sec; during generalization programming, a mean of 82% of appropriate cues was followed by praise. (The percentage of positive attention to inappropriate cues was much lower, although they were responded to about 30% of the time.) During Experiment II, the total rates of praise averaged 16.9 in baseline and 16.3 in generalization programming. However, the children exerted some control over the occasion of that praise. Cued praise increased from a mean of 1.2 per day to a mean of 2.4 per day, whereas uncued praise decreased from a mean of 15.7 to 13.9 per day. These data concerning praise of appropriate cues are very important, for they established that the children increased their rates of cueing without loss of efficiency. Also, these children displayed control of some teacher behavior at the time it was requested by the trainer. Presumably, they could exercise similar control in other settings where such prompting skills would be beneficial to the quality of teacher-child interaction.

Comparison of work output across conditions was not appropriate in Experiment II because the academic tasks were not constant throughout the experiment. The academic program of the remedial class systematically required increasingly difficult tasks for each child, as current tasks were mastered. However, data collected in the same manner as in Experiment I (with near 100% reliability) showed that the children maintained a similar high level of proficiency throughout the study, even while the work materials increased in difficulty, *i.e.,* on average, 41 items or 83% of those attempted were correct during baseline, and 47 items or 86% of those attempted were correct during generalization programming.

An examination of the schedules of praise was also undertaken in this experiment. In that

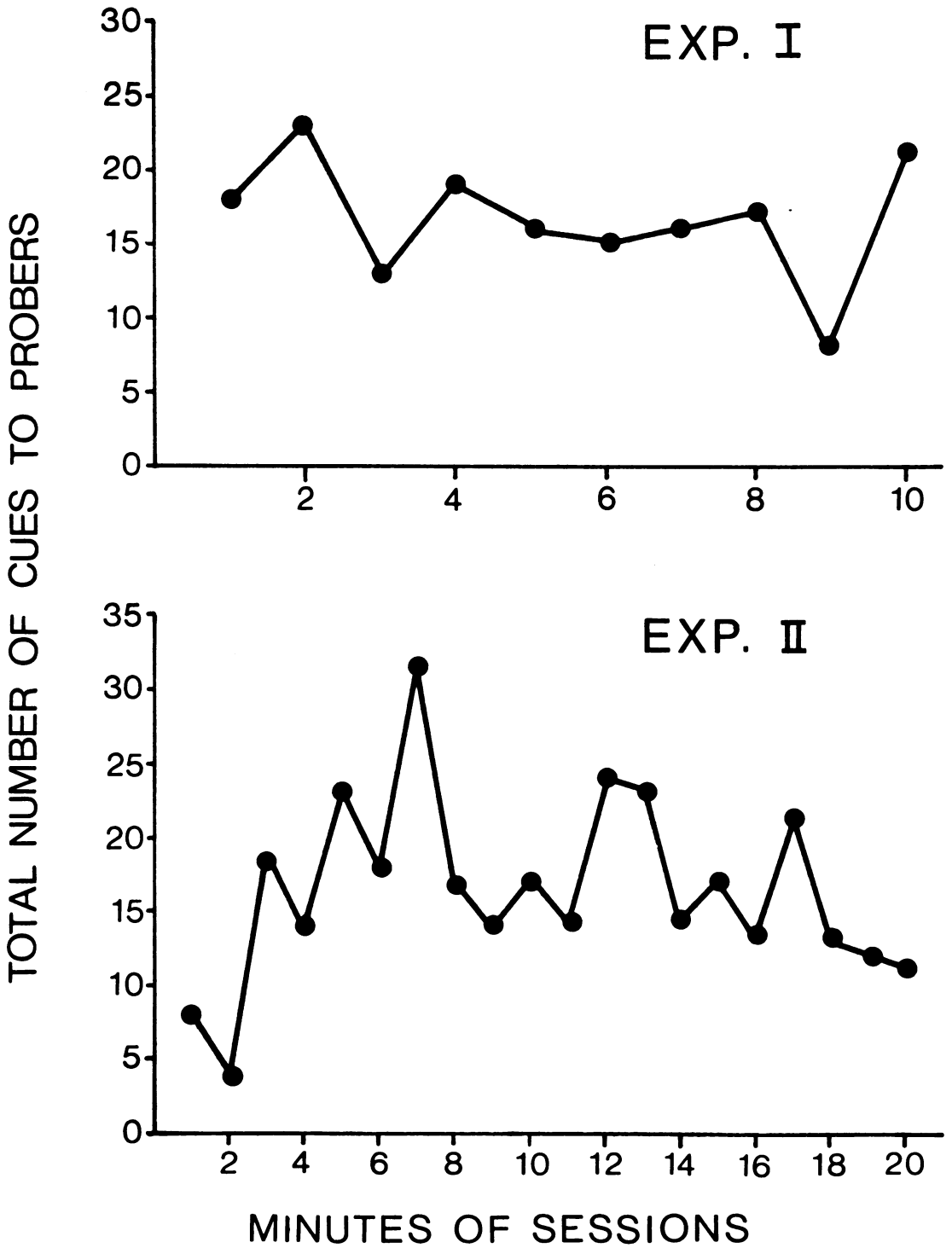

Fig. 6. Experiments I and II: distribution of cues to probers during generalization sessions.

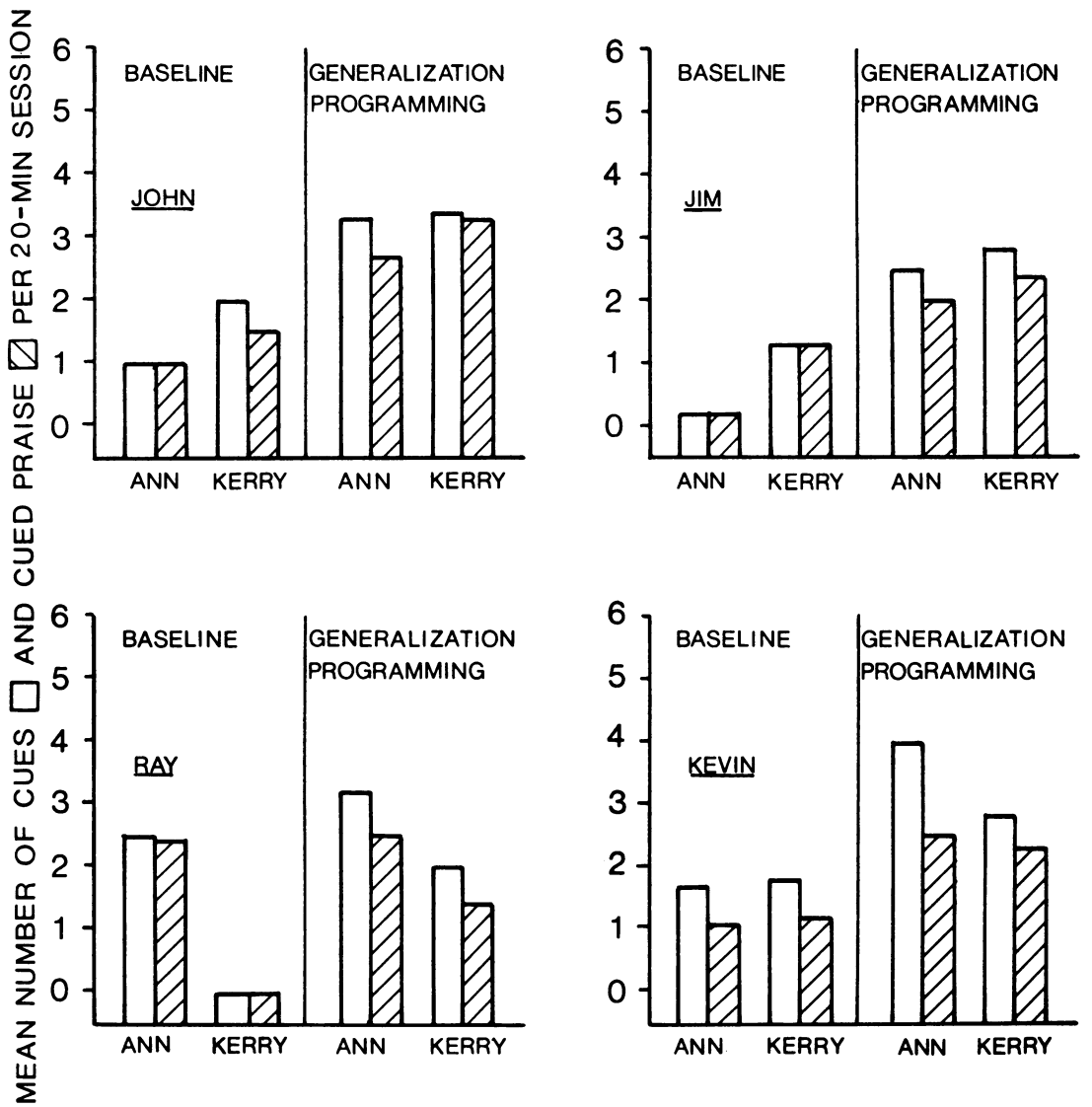

Fig. 7. Experiment II: mean number of cues given and cued praise received with each prober during each experimental condition. The open bars indicate the mean number of children's cues to probers, and the shaded bars show the mean number of the prober's praises following cues.

the probers had intensive behavior-modification training, and because the classroom was a remedial preschool, rather than a research or teacher-training setting, a relatively high rate of praise occurred during both baseline and intervention conditions. But because the rates of praise were already at what seemed to be an optimal level during baseline (*i.e.*, praise on the average of every three items attempted or correct), changes of the magnitude of those observed in the first experiment were not sought in this experiment. Nevertheless, the mean rates of praise increased from one praise per 3.5 items to one praise per 3.1 items attempted, and from one praise per 2.9 items to one praise per 2.6 items correct. What was shown clearly in this experiment was that these deviant children could generalize their cueing to a natural classroom—a setting with more children competing for the teacher's attention, and where the academic

materials reflected the diversity typical of regular classrooms.

GENERAL DISCUSSION

The present research supports and extends previous studies of adult-child interaction and natural communities of reinforcement. As did Graubard *et al.* (1971), Cantor and Gelfand (1977), Seymour and Stokes (1976), and Sherman and Cormier (1974), the present experiments established that children can control the behavior of adults during social and academic interactions. This study also demonstrated that preschool children actively can recruit a natural community of probable reinforcement. This is an advance in the use of natural reinforcement communities, in that previous studies (*e.g.,* Ingram's, reported by Baer and Wolf, 1970) sought out and took advantage only of already operating natural communities of reinforcement. That is, the present study showed that normal and deviant children could successfully modify their teachers' interaction, as established by rates of cued praise and schedules of praise. Thus, the interactive cycle between cues and praise was programmed—a reciprocal interaction (Baltes and Reese, 1977) was set up in which children repeatedly acted upon their teachers, who reacted in a positive manner likely to influence the children's behavior. Examination of such reciprocal interaction effects should become a more prominent feature of behavior analysis research.

This study did not determine whether the reciprocal interaction it generated was functional in maintaining the children's behavior changes. However, the feasibility of analyzing maintenance functions was established. The necessary initial changes were accomplished: a complex interaction was created in which the subject changed the environment, which in turn reacted on the subject to control behavior that again acted on the environment, and so on. Thus, future research should examine whether the children's academic and cueing behavior would continue to control the teachers' praise, and whether the teachers' praise in turn would continue to control the children's academic and cueing behavior.

In the present study, a low rate of cueing was taught so that the children worked relatively independently and did not become nuisances to their teachers through overly sustained prompting for interaction. A valid question, though, is whether a low rate of cueing is the correct rate to teach? Under certain classroom conditions, perhaps a zero rate of cueing would be appropriate. In other situations, a low or a high rate may be acceptable. There are as yet no *a priori* guidelines; it is an empirical question to which the answer might vary for different children, different adults, different tasks, different settings, and different times. The fact that these children were able to accomplish desirable changes in the behavior of their teachers suggests that at least in these situations, the rate of cueing was acceptable because the teachers responded positively to the cues most of the time. It may be assumed that the rates displayed by these children were appropriate because they were rates that the environment tolerated (*cf.* Warren, Rogers-Warren, and Baer, 1976). In fact, in the present settings, the environment consistently provided more support for a low rate of cueing that was higher than the baseline rate. That is, approximately 72% of appropriate cues were followed by praise in baseline, whereas approximately 88% of appropriate cues were followed by praise during the generalization-programming condition.

If a rate of appropriate cueing does vary across situations, then how is an optimal rate determined? Some guidelines may be suggested by the present study. Whenever possible, consult first with the teachers in relevant settings to ascertain an acceptable level of child prompting. This may be the best initial guide when instructing a child concerning cueing rate in similar settings. However, this rate might then need to be amended according to its success in evoking praise. This modification should come after ob-

serving and/or discussing with the child the environmental tolerance for cueing. Thus, a trainer outside of the classroom should ask the child to report on how many cues were given, when they were given, and the nature of the teacher's responses. Accurate reporting behaviors should have been taught as part of the initial training (see Risley and Hart, 1968; Rogers-Warren and Baer, 1976). These reports should give clues about necessary modifications of rate, topography, or occasion of cueing. For example, in Experiment II the trainer requested the children to cue three times. However, on a few occasions, the children would cue only two times, reporting to the trainer that only two units of work had been completed, and therefore only two reasonable cueing opportunities were available. This feedback informed the trainer about optimal cueing. Similar feedback might facilitate adjustment of cueing according to such factors as the task materials, number of other children in the classroom, and density of teacher attention. After a number of such teachings about different environments, the child may become more adept at determining optimal rates and topographies of cueing.

The data concerning inappropriate cueing were significant because they emphasized a potential problem in teaching cueing: that of teaching a skill the children might then use at unacceptable times or in unacceptable circumstances to solicit attention from their teachers. In the present study, appropriate cues were discriminated to occasions of teacher proximity. It is encouraging to note that only one of the four children in Experiment II displayed any substantial rate of clearly inappropriate cues. Furthermore, it is noteworthy that the teachers attended to inappropriate cues at a rate significantly lower than their rate of positive attention to appropriate cues. However, the teachers' schedule of praise for Kevin's inappropriate cues (VR 3) was not lean enough within the baseline period to decrease those cues; but the added intervention procedures were effective in reducing them.

Consistent effort was made throughout this study to teach a diverse cueing repertoire. Stereotyped responding is likely to be regarded as mechanical and unnatural, and therefore may fail to evoke praise from teachers. Teaching a number of different cues to be used at different times requires greater training time, but the potential gain in terms of the adaptability and permanence of the repertoire probably outweighs that cost.

Even though contingencies were never placed directly on work output and quality, an increase in correct work was recorded. That is, good work was stressed by the trainer, but the children were not required to complete a certain number of items correctly. The trainer placed direct contingencies only on cueing frequency; and because of the nature of the chain of responses taught during training, indirect contingencies (probably indiscriminable contingencies, see Stokes and Baer, 1977) thereby were placed on work quality. The increased accuracy of academic production was probably a function of both the trainer's intervention procedures and the teachers' praise (reinforcement community) evoked by the cueing, although it may have been a function of either alone. However, it should be noted that the children need not have changed work accuracy from the baseline to the generalization-programming condition in order to cue appropriately; there was already enough good work from which to cue.

In summary, preschool children were taught to make judgements concerning the quality of their own work. In addition, they were taught a relatively sophisticated skill of drawing their teachers' attention to the quality of that work. Furthermore, when those skills did not generalize spontaneously to relevant classroom situations, generalized responding was programmed by use of contingent delayed consequences dispensed by the trainer. When these generalized behavior changes were programmed, the children then were able to contact a sometimes dormant, but readily available natural community of praise and were able then to recruit and

cultivate an increase in their rates of cued praise and schedules of praise. Thus, if the introduction to this natural community of presumed reinforcement had been effective, and the child displayed a repertoire of skills appropriate in quality, diversity, rate, and distribution, the presumed reinforcement community might then be expected to accomplish further improved performance and to maintain that improved performance. And, indeed, such increases were observed (but perhaps were due to the trainer). The trainer might then be able to fade and eventually withdraw all experimental support of the childrens' behaviors without detrimental effect. The examination of such an outcome is a high-priority question for future research. One final, and not insignificant, aspect of these techniques is a change in the usual locus of control in child behavior modification, *i.e.,* the children became more active agents of their own behavior change, rather than serving in contingencies applied by other powerful persons in their environment.

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